

Table 69 - Test Output Parameters

Parameter Name	Value	Description	Default
Test Output Mode	Not Used	An external device is not connected.	Not Used
	Standard	The output is connected to a standard device.	
	Pulse Test	A contact output device is connected. Use in combination with a safety input.	
	Power Supply	The power supply of a Safety Sensor is connected. The voltage supplied to I/O power (V, G) is output from the test output terminal.	
	Muting Lamp Output 1791ES-IB8XOBV4, 1732ES-IB8XOBV4, 1732ES-IB8XOB8 modules = T3 and T7 1791ES-IB16, 1732ES-IB16 modules = T3, T7, T11, and T15 1732ES-IB12XOBV2, 1732ES-IB12XOB4 modules = T3, T7, and T11	An indicator is connected and turned ON to detect broken lines in an external indicator.	

Table 70 - Safety Output Parameters

Parameter Name	Value	Description	Default
Output Point Mode	Not Used	An external output device is not connected.	Not Used
	Safety	When the output is ON, the test pulse is not output (remains ON).	
	Safety Pulse Test	By using this function, short circuits between output signal lines and the power supply (positive side) and short circuits between output signal lines can be detected.	
Output Point Operation Type	Single Channel ⁽¹⁾	Use as single channel.	Dual-channel
	Dual-channel	Use as dual-channel. When both channels are normal, outputs can be turned ON.	

(1) 1732ES-IB12XOB4 and 1732ES-IB8XOB8 modules only.

Specifications

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Technical Specifications

This section provides technical specifications for the modules.

1791ES Modules

For 1791ES modules, see [Table 71](#) and [Table 72](#).

Table 71 - 1791ES-IB16 and 1791ES-IB8X0BV4 Modules – Technical Specifications

Attribute	Value
Safety input	
Inputs type	Current sinking
Voltage, on-state input, min	11V DC
Current, on-state input, min	3.3 mA
Voltage, off-state input, max	5V DC
Current, off-state, max	1.3 mA
IEC 61131-2 (input type)	Type 3
Pulse test output	
Output type	Current sourcing
Pulse test output current	0.7 A per output 8 A total module at 40 °C (104 °F) 6 A total module at 60 °C (140 °F) for 1791ES-IB8X0BV4 (see Product temperature versus current derating) 8 A total module at 60 °C (140 °F) for 1791ES-IB16
Residual voltage, max	1.2V
Output leakage current, max	0.1 mA
Short circuit protection	Yes
Current, max	25 mA – current, max (to avoid fault when used as a muted lamp output)
Current, min	5 mA – current, min (at which fault indication is generated when used as a muted lamp output)
Safety output	

Table 71 - 1791ES-IB16 and 1791ES-IB8XOBV4 Modules – Technical Specifications (Continued)

Attribute	Value
Output types	Current sourcing/current sinking – bipolar pair
Output current rating	2 A max per point 8 A total module at 40 °C (104 °F) (see temperature versus current derating) 6 A total module at 60 °C (140 °F)
Voltage and current ratings	IN PWR (No Load): 19.2-28.8 Vdc, 190 mA @ 24 Vdc typ. No load Inputs: 11-30Vdc, 3.5mA Test Outputs: 19.2-28.8Vdc, 700mA Sum of P and M Currents: 8 A at 40 °C (104 °F), 6 A at 60 °C (140 °F) P & M Outputs: 19.2-28.8Vdc, 2A; 2.5A Inrush. Max. Current (Input plus Output): 8A@40C, 6A@60C. Operating Temperature: -20 °C to +60 °C (140 °F)
On-state voltage drop	+/- 0.6V
Leakage current	+/- 1.0 mA ⁽¹⁾
Internal resistance from P to M terminal	3.25 kΩ
Short circuit detection	Yes (short high and low and cross-circuit fault detection)
Short circuit protection	Electronic
Aggregate current of module	8 A at 40 °C (104 °F), 6 A at 60 °C (140 °F) (see product temperature versus current derating)
Pilot duty rating	2.5 A inrush for 1791ES-IB8XOBV4 module
Number of outputs	4, dual-channel

(1) Includes the presence of one P stuck-high or M stuck-low short.

Table 72 - 1791ES-IB16 and 1791ES-IB8XOBV4 Modules – General

Attribute	Value
North American temp code	1791ES-IB8XOBV4: T4A 1791ES-IB16: T5
Enclosure type rating	Meets IP20
Communication current consumption	250 mA at 24V DC
Operating voltage range	19.2 . . . 28.8V DC (24V DC, -20 . . . 20%)
Isolation voltage	1791ES-IB16 - 50V (continuous), basic insulation - type tested at 800V DC for 60 s between input channels and network 1791ES-IB8XOBV4 - 50V (continuous), basic insulation - type tested at 800V DC for 60 s between input and output channels and between I/O and network

Table 72 - 1791ES-IB16 and 1791ES-IB8X0BV4 Modules – General (Continued)

Attribute	Value
Product temperature versus current derating	<p>Product Temperature Versus Current Derating (combined current from both input and output supplies)</p>
Wiring category ⁽¹⁾	2 - on signal ports, 2 - on power ports, 2 - on communication ports
Wire size	Power and I/O wiring: 0.34...1.5 mm ² (22...16 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation max
Weight, approx	600 g (1.32 lb)
Dimensions (HxWxD), approx.	80 x 196 x 77 mm (3.2 x 7.7 x 3 in.) with terminal block 77 x 196 x 62 mm (3 x 7.7 x 2.5 in.) without terminal block

(1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

1732ES Modules

For 1732ES modules, see [Table 73](#) and [Table 74](#).

Table 73 - 1732ES-IB16, 1732ES-IB8X0B8, 1732ES-IB8X0BV4, 1732ES-IB12X0B4, and 1732ES-IB12X0BV2 Modules – Technical Specifications

Attribute	Value
Safety input	
Inputs type	Current sinking
Voltage, on-state input	11...30V DC
Current, on-state input	3.5 mA
Voltage, off-state input, max	5V DC
Current, off-state, max	1 mA
IEC 61131-2 (input type)	Type 3
Pulse test output	
Output type	Current sourcing
Pulse test output current (each) (all 1732ES modules except 1732ES-IB16)	0.7 A max per point at 40 °C (104 °F) 0.3 A max per point at 55 °C (131 °F) See Product temperature versus pulse test output current derating (All 1732ES modules except 1732ES-IB16) on page 165 .
Pulse test output current (1732ES-IB16 only)	0.7 A max per point 8.4 A max per module
Residual voltage, max	1.2V

Table 73 - 1732ES-IB16, 1732ES-IB8XOB8, 1732ES-IB8XOBV4, 1732ES-IB12XOB4, and 1732ES-IB12XOBV2 Modules – Technical Specifications

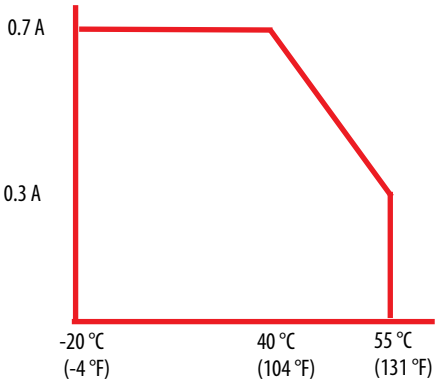
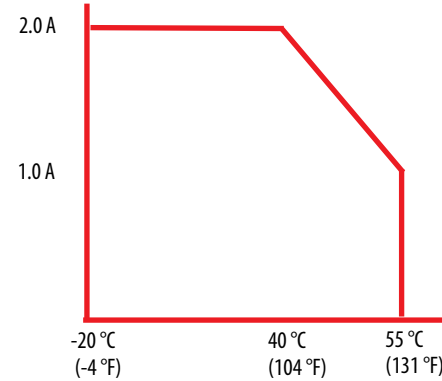
Attribute	Value
Output leakage current, max	0.1 mA
Short circuit protection	Yes
Current, max	25 mA – current, max (to avoid fault when used as a muted lamp output)
Current, min	5 mA – current, min (at which fault indication is generated when used as a muted lamp output)
Safety output	
Output types	1732ES-IB12XOBV2, 1732ES-IB8XOBV4: Current sourcing/current sinking bipolar pair 1732ES-IB12XOB4, 1732ES-IB8XOB8: Current sourcing
Output current rating (each)	1732ES-IB12XOBV2, 1732ES-IB8XOBV4: 2 A max per point, bipolar outputs 1732ES-IB12XOB4, 1732ES-IB8XOB8: 1 A max per point, sourcing outputs
On-state voltage drop, max	1.15V
Leakage current	1732ES-IB12XOB4, 1732ES-IB8XOB8: +/-0.1 mA 1732ES-IB12XOBV2, 1732ES-IB8XOBV4: +/-1.0 mA ⁽¹⁾
Internal resistance from sourcing to sinking terminal	1732ES-IB12XOBV2, 1732ES-IB8XOBV4: 3.25 kΩ 1732ES-IB12XOB4, 1732ES-IB8XOB8: N/A
Short circuit detection	Yes (short high and low and cross-circuit fault detection)
Short circuit protection	Electronic
Pilot duty rating (1732ES-IB12XOBV2, 1732ES-IB8XOBV4 only)	DC13, 2.5 A inrush
Number of outputs	Safety outputs 1732ES-IB12XOB4 module, 4 sourcing outputs 1732ES-IB12XOBV2 module, 4 bipolar outputs, (2 pairs) 1732ES-IB8XOB8 module, 8 sourcing outputs 1732ES-IB8XOBV4 module, 8 bipolar outputs (4 pairs)
Output power current rating (pins 1, 3, and 5 of each output signal I/O connector)	2 A max per point at 40 °C (104 °F) 1 A max per point at 55 °C (131 °F) See Product temperature versus output power current derating (per pin) on page 165 .

(1) Includes the presence of one sourcing output stuck-high or sinking output stuck-low fault.

Table 74 - 1732ES-IB16, 1732ES-IB8XOB8, 1732ES-IB8XOBV4, 1732ES-IB12XOB4, and 1732ES-IB12XOBV2 Modules – General

Attribute	Value
Enclosure type rating	Meets IP65/IP67 (when marked)
Product current consumption (not including Test output or Safety output load current)	1732ES-IB12XOBV2: <ul style="list-style-type: none"> In power (no load): 19.2...28.8V DC, 175 mA at 24V DC Out power (no load): 19.2...28.8V DC, 65 mA at 24V DC 1732ES-IB12XOB4: <ul style="list-style-type: none"> In power (no load): 19.2...28.8V DC, 175 mA at 24V DC Out power (no load): 19.2...28.8V DC, 45 mA at 24V DC 1732ES-IB8XOB8: <ul style="list-style-type: none"> In power (no load): 19.2...28.8V DC, 165 mA at 24V DC Out power (no load): 19.2...28.8V DC, 65 mA at 24V DC 1732ES-IB8XOBV4: <ul style="list-style-type: none"> In power (no load): 19.2...28.8V DC, 165 mA at 24V DC Out power (no load): 19.2...28.8V DC, 110 mA at 24V DC 1732ES-IB16: <ul style="list-style-type: none"> In power (no load): 19.2...28.8V DC, 190 mA at 24V DC
Operating voltage range	19.2...28.8V DC (24V DC, -20...20%)
Module power connector rating	10 A max per pin

Table 74 - 1732ES-IB16, 1732ES-IB8X0B8, 1732ES-IB8X0BV4, 1732ES-IB12X0B4, and 1732ES-IB12X0BV2 Modules – General (Continued)

Attribute	Value												
Isolation voltage	50V (continuous), Basic Type, Input Power and I/O to Ethernet, Input Power and I/O to Output Power and IO, and Output Power and IO to Ethernet Tested at 707V DC for 60s												
Product temperature versus pulse test output current derating (All 1732ES modules except 1732ES-IB16)	 <p style="text-align: center;">Product Temperature Versus Pulse Test Output Current Derating</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data for Product Temperature Versus Pulse Test Output Current Derating</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Temperature (°F)</th> <th>Current (A)</th> </tr> </thead> <tbody> <tr> <td>-20</td> <td>(-4)</td> <td>0.7</td> </tr> <tr> <td>40</td> <td>(104)</td> <td>0.7</td> </tr> <tr> <td>55</td> <td>(131)</td> <td>0.3</td> </tr> </tbody> </table>	Temperature (°C)	Temperature (°F)	Current (A)	-20	(-4)	0.7	40	(104)	0.7	55	(131)	0.3
Temperature (°C)	Temperature (°F)	Current (A)											
-20	(-4)	0.7											
40	(104)	0.7											
55	(131)	0.3											
Product temperature versus output power current derating (per pin)	 <p style="text-align: center;">Product Temperature Versus Output Power Current Derating (per pin)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data for Product Temperature Versus Output Power Current Derating (per pin)</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Temperature (°F)</th> <th>Current (A)</th> </tr> </thead> <tbody> <tr> <td>-20</td> <td>(-4)</td> <td>2.0</td> </tr> <tr> <td>40</td> <td>(104)</td> <td>2.0</td> </tr> <tr> <td>55</td> <td>(131)</td> <td>1.0</td> </tr> </tbody> </table>	Temperature (°C)	Temperature (°F)	Current (A)	-20	(-4)	2.0	40	(104)	2.0	55	(131)	1.0
Temperature (°C)	Temperature (°F)	Current (A)											
-20	(-4)	2.0											
40	(104)	2.0											
55	(131)	1.0											
Wiring category ⁽¹⁾	2 - on signal ports 2 - on power ports 2 - on communication ports												
Weight, approx	786 g (1.73 lb)												
Dimensions (HxWxD), approx	70 x 259 x 69 mm (2.8 x 10.2 x 2.7 in.) without cables												

(1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

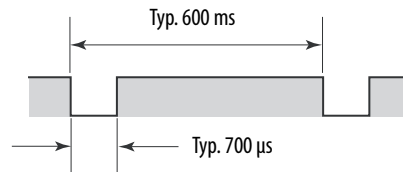
Environmental Specifications This section provides environmental specifications for the modules.

- For 1791ES modules, see [Table 75 on page 166](#).
- For 1732ES modules, see [Table 76 on page 167](#).

Table 75 - 1791ES-IB16 and 1791ES-IB8XOBV4 Modules – Environmental Specifications

Attribute	Value
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-20...+60 °C (-4...+140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g at 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	8 kV contact discharges 10 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on power ports ±3 kV at 5 kHz on signal ports ±2 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on communication ports
Reaction time	
Input reaction time, max	16.2 ms + set values of ON/OFF delays
Output reaction time, max	6.2 ms + (20 ms) relay response time

Signal sequence

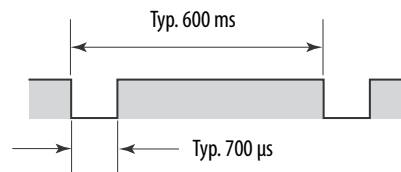


While safety outputs are in an on state, the signal sequence shown in the figure is output continuously for fault diagnosis. Confirm response time of device connected to safety outputs so the device does not malfunction due to off pulse.

Table 76 - 1732ES-IB16, 1732ES-IB8X0B8, 1732ES-IB8X0BV4, 1732ES-IB12X0B4, and 1732ES-IB12X0BV2 Modules – Environmental Specifications

Attribute	Value
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-20...+55 °C (-4...+131 °F) (All 1732ES modules except 1732ES-IB16 modules)
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-20...+60 °C (-4...+140 °F) (Only 1732ES-IB16 modules)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g at 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	4 kV contact discharges 10 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on power ports ±1 kV at 5 kHz on signal ports ±1 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on communication ports
Reaction time	
Input reaction time, max	16.2 ms + set values of ON/OFF delays
Output reaction time, max	6.2 ms + (20 ms) relay response time

Signal sequence



While safety outputs are in an on state, the signal sequence shown in the figure is output continuously for fault diagnosis. Confirm response time of device connected to safety outputs so the device does not malfunction due to off pulse.

Certifications

This section provides certification information for the 1791ES and 1732ES modules.

Table 77 - 1791ES and 1732ES Modules – Certifications

Certification ⁽¹⁾	1732ES-IB16, 1732ES-IB8XOB8, 1732ES-IB8XOBV4, 1732ES-IB12XOBV2, 1732ES-IB12XOB4, 1791ES-IB16, 1791ES-IB8XOBV4
CE	European Union 2004/108/EC EMC Directive, compliant with these norms: EN 61326-1; Meas./Control/Lab, Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61010-2-201; Control Equipment Safety Requirements EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
EtherNet/IP	ODVA conformance tested to CIP Safety on EtherNet/IP specifications
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with Article 58-2 of Radio Waves Act, Clause 3
RCM, C-Tick	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
TUV	Capable of Cat. 4/PL e according to EN ISO 13849-1 and SIL 3 according to EN 62061/IEC 61508 ⁽²⁾
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810. (1791ES only)
C-Tick	Australian Radiocommunications Act

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

(2) When used with specified firmware revisions, and as described in the GuardLogix® 5570 and Compact GuardLogix 5370 Controller Systems Safety Reference Manual, publication [1756RM-099](#), and the Guard I/O™ EtherNet/IP Safety Modules, publication [1791ES-UM001](#).

Europe

The type approval of TÜV-Rheinland addresses compliance to applicable requirements of the following directives and standards:

- EU legislation
 - Low-voltage Directive 73/23/EEC
 - EMC Directive 89/336/EEC
- European standards
 - EN 61508 (SIL1-3)
 - EN 61131-2
 - EN 60204-1
 - IEC 61000-6-2
 - IEC 61000-6-4
 - ISO 13849-1:2008